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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 December 2010*.

2a)☐ This action is **FINAL**.　　　2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4-20 and 22-32* is/are pending in the application.

　　4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,5-8,11,13-20 and 32* is/are rejected.

7)☒ Claim(s) *4,9,10,12,22* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

　　Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

　　Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

　　a)☐ All　b)☐ Some * c)☐ None of:

　　　1.☐ Certified copies of the priority documents have been received.

　　　2.☐ Certified copies of the priority documents have been received in Application No. _____.

　　　3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

　　* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08)
　　Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
　　Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

Response to Arguments

1.   Applicant's arguments filed 12/13/2010 have been fully considered but they are not persuasive. Applicant's arguments with regards to Feng have been addressed in previous office actions and interviews. Examiner respectfully disagrees with applicant's arguments pg. 10. Applicant's claim language does not disclose microphone matching.

2.   Arguments pg. 11 Feng is not restricted to hardware as applicant asserts Feng clearly discloses shaping and steering (col. 6 lines 10-65, col. 7 lines 15-43).

3.   Arguments pg. 12 Examiner asserts that not only are different directional types of microphones well known in the art. It is also well known in the art at the time of the invention to derive different directional responses from the signal processing of directional microphone signals. See newly added reference Bradley (5463694).

4.   Argument's pg. 13-14, Examiner respectfully disagrees, deriving directional responses through weighted summing of microphone signals is well known in the art. The type of microphone: omni-directional, bi-directional etc do not constitute allowable subject matter because applicant's claimed microphone and subtraction and summing steps are already well known in the art at the time of the invention.

5.   Argument's pg. 15, Market success is not necessarily an indication of non-obviousness. Objective evidence of non-obviousness including commercial success must be commensurate in scope to the claims. See MPEP 716.03

Allowable Subject Matter

1.   Claims 4, 9-10, 12, 22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims and overcoming the 112 rejection as set forth below.

Claim Rejections - 35 USC § 112

1.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2.   Claim 1,20, 32 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1, line 17-18,"...the derivative with respect to signal weight of the energy of the output signal is about zero." Applicant's specification discloses the derivative is set to zero (see pg. 11 line 17-22). Furthermore a derivative set to "about zero" gives a completely different result than a derivative set to zero. Examiner interprets claim 1 as derivative set to zero.

The same analysis for claim 20 and 32.

Claim Rejections - 35 USC § 103

3.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

4.   Claims 1, 5-8, 13-15, 17-20, 23-25, 28-30, 32 are rejected under 35 U.S.C.

103(a) as being unpatentable over Bradley (5463694) in view of Feng et al (7076072).

Claim 1, Bradley discloses a method executed by a processor for producing a combined

directional signal (Fig. 1-2), the method comprising: deriving from two omni-directional

microphones a first signal having an omni-directional polar pattern (Fig. 2 signal 223);

and deriving from the two omni-directional microphones a second signal having a bi-

directional polar pattern (Fig. 2 signal 221), and constructing the combined directional

signal from a weighted sum of a first signal weight of the first signal and a second signal

weight of the second signal (Fig. 2 and col. 5 line 24-46 and line 65-67 and col. 6 line 1-

4),

Bradley does not explicitly disclose deriving from one of two omni-directional

microphones the first signal having an omni-directional polar pattern. However Bradley

discloses deriving from the average of two omni-directional microphones the first signal

having an omni-directional polar pattern (Fig. 2 col. 5 line 57-59). It would have been

obvious to one of ordinary skill in the art at the time of the invention to try a single omni-

directional mic or an average of a number of omni-directional mics in order to provide an

omni-directional signal with reduced artifacts or in order to fit size restrictions of an

audio device.

Bradley does not explicitly disclose a method for producing a combined adaptive

directional signal wherein the first signal weight and the second signal weights are

calculated in a non-iterative manner by an optimiser, the optimiser taking the first signal

and the second signal as

inputs, and the optimiser determining from the first and second signals the first and

second signal weights by mathematically calculating the first and second signal weights

in a manner to comply with predefined constraints that: (i) the weighted sum is to give

the combined adaptive directional signal a constant gain in a predetermined direction,

by imposing a constraint that the first signal weight and the second signal weight add to

a predetermined value and (ii) power of the combined adaptive directional signal is

substantially minimized by ensuring that the derivative with respect to signal weight of

the energy of the output signal is zero.

However Bradley discloses weights for the first and second signals (Fig. 2).

Feng discloses a method for producing a combined adaptive directional signal wherein

the first signal weight and the second signal weights are calculated in a non-iterative

manner by an optimizer (Fig. 1 col. 6 line 10-55), the optimiser taking the first signal and

the second signal as

inputs, and the optimiser determining from the first and second signals the first and

second signal weights by mathematically calculating the first and second signal weights

in a manner to comply with predefined constraints that: (i) the weighted sum is to give

the combined adaptive directional signal a constant gain in a predetermined direction,

by imposing a constraint that the first signal weight and the second signal weight add to

a predetermined value (Fig. 1 and col. 6 line 15-35)and (ii) power of the combined

adaptive directional signal is substantially minimized by ensuring that the derivative with

respect to signal weight of the energy of the output signal is zero (abstract col. 6 line 45-

65)

Furthermore Feng discloses the first and second signal can be derived from

microphones of various directivity including omni-directional and bi-directional (col. 18

line 30-37).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the

invention to modify the microphone configuration of Bradley with the adaptive summing

process of Feng in order to better suppress interference in input audio signals.

Claim 5 analyzed with respect to claim 1wherein, Feng discloses wherein said signal

weights are calculated for a series of frames, each frame having a predetermined length

consisting N first signal samples and N second signal samples (Fig. 6-7, col. 8 line 21-

40).

Claim 6 analyzed with respect to claim 1, 5 Feng does not explicitly disclose wherein N=64. However it would have been obvious to one of ordinary skill in the art at the time of the invention that design choice would determine the number of samples in order to provide a designer with a desired degree of fidelity.

Claim 7 analyzed with respect to claim 1, 5, Feng does not explicitly disclose discloses further including filtering or smoothing the series of weights to minimize frame-to-frame variation in the calculated weights.

Examiner takes Official Notice on the limitation smoothing the series of weights to minimize frame-to-frame variation in the calculated weights. Smoothing a weight, gain or coefficient value in order to avoid artifacts or abrupt changes in an audio processing system is well known in the art at the time of the invention. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the process of Fig. 7 in Feng with a weight smoothing processes in order to minimize artifacts.

Claim 8 analyzed with respect to claim 1, Feng discloses wherein the first and second signals are sampled, the signal weights being calculated for successive sets of said first and second signals samples (Fig. 6 and col. 8 line 20-40 and col. 9 line 1-4).

Claim 13 analyzed with respect to claim 1, Bradley in view of Feng disclose wherein the

omni-directional microphones comprise a front microphone and a rear microphone, and

said predetermined direction is the forward direction along the microphone axis (Bradley

Fig. 2, 5).

Claim 14 analyzed with respect to claim 1, 13 Bradley in view of Feng disclose wherein

the second signal is provided by the difference between signals produced by the front

and rear microphones, without the use of a delay element (Bradley Fig. 2 signals 109 &

111).

Claim 15 analyzed with respect to claim 13-14, 1, Bradley in view of Feng disclose

further comprising processing the second signal by means of an integrator element or

an integrator-like filter before constructing the combined signal, thereby compensating

for the attenuation of low frequencies and phase shifts introduced in the subtraction of

the two omni-directional signals (Bradley Fig. 2 .element 217).

Claim 17 analyzed with respect to claim 1 Feng discloses wherein said first and second

signals are frequency domain samples (Fig. 7 and col. 5 line 60-67 and col. 6 line 1-13).

Claim 18 analyzed with respect to claim 17, 1, Feng discloses further comprising

calculating and applying the weights to several independent subsets of frequency

domain samples, to give different directional responses at different frequencies and/or to allow selective suppression of different frequencies (col. 6 line 41-60 and col. 8 line 21-27).

Claim 19 analyzed with respect to claim 1, Feng discloses comprising applying a frequency weighting function to said first and second signal before calculating said signal weights (col. 6 line 14-65).

Claim 20, Bradley discloses an apparatus for producing a combined directional signal, (Fig. 1-2) the apparatus comprising: producing from two omni-directional microphones a first signal having an omni-directional polar pattern (Fig. 2 signal 223); a differencing element for deriving from the two omni-directional microphones a second signal having a bi-directional polar pattern (Fig. 2 signal 221); a summation device for constructing the directional signal from a weighted sum of a first signal weight of the first signal and a second signal weight of the second signal (Fig. 2 and col. 5 line 24-46 and line 65-67 and col. 6 line 1-4),

Bradley does not explicitly disclose deriving from one of two omni-directional microphones the first signal having an omni-directional polar pattern. However Bradley discloses deriving from the average of two omni-directional microphones the first signal having an omni-directional polar pattern (Fig. 2 col. 5 line 57-59). It would have been obvious to one of ordinary skill in the art at the time of the invention to try a single omni-

directional mic or an average of a number of omni-directional mics in order to provide an omni-directional signal with reduced artifacts or in order to fit size restrictions of an audio device.

Bradley does not explicitly discloses an analog-to-digital converter for producing the microphone signals and an optimiser for calculating the first signal weight and the second signal weight in a non-iterative manner, the optimiser taking the first signal and the second signal as inputs, and the optimiser determining from the first and second signals the first and second signal weights by mathematically calculating the first and second signal weights in a manner to comply with predefined constraints that: (i) the weighted sum is to give the combined adaptive directional signal a constant gain in a predetermined direction, by imposing a constraint that the first signal weight and the second signal weight add to a predetermined value and (ii) power of the combined adaptive directional signal is substantially minimized by ensuring that the derivative with respect to signal weight of the energy of the output signal is zero.

Feng discloses an analog-to-digital converter for producing the microphone signals (Fig. 1, 6) and an optimiser for calculating the first signal weight and the second signal weight in a non-iterative manner, the optimiser taking the first signal and the second signal as inputs, and the optimiser determining from the first and second signals the first and second signal weights by mathematically calculating the first and second signal weights (Fig. 1 col. 6 line 10-55), in a manner to comply with predefined constraints that: (i) the weighted sum is to give the combined adaptive directional signal a constant gain in a predetermined direction, by imposing a constraint that the first signal weight and the

second signal weight add to a predetermined value and (ii) power of the combined

adaptive directional signal is substantially minimized by ensuring that the derivative with

respect to signal weight of the energy of the output signal is zero (abstract col. 6 line 15-

65).

Furthermore Feng discloses the first and second signal can be derived from

microphones of various directivity including omni-directional and bi-directional (col. 18

line 30-37).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the

invention to modify the microphone configuration of Bradley with the adaptive summing

process of Feng in order to better suppress interference in input audio signals.

Claim 23 analyzed with respect to claim 20, Feng further discloses including means for

calculating said signal weights for a series of frames, each frame having a

predetermined length consisting of N first signal samples and N second signal samples

(Fig. 6-7, col. 8 line 21-40).

Claim 24 analyzed with respect to claim 20 recites the limitations of claim 7

Claim 25 analyzed with respect to claim 20, Feng further discloses including means for

calculating said weights continuously for samples of said first and second signals (Fig.

6-7, col. 8 line 21-40).

Claim 28 analyzed with respect to claim 20 recite the limitations of claim 13.

Claim 29 analyzed with respect to claim 20, recite the limitations of claim 14.

Claim 30 analyzed with respect to claim 20, 28 see claim 15

Claim 32, Bradley discloses a computer program stored in a computer-readable storage

medium, said computer program, when executed by a computer, performing the steps

(Fig. 1, 5) of: deriving from two omni-directional microphones a first signal having an

omni-directional polar pattern (Fig. 2 signal 223); deriving from the two omni-directional

microphones a second signal having a bi-directional polar pattern (Fig. 2 signal 221);

and constructing the combined directional signal from a weighted sum of a first signal

weight of the first signal and a second signal weight of the second signal (Fig. 2 and col.

5 line 24-46 and line 65-67 and col. 6 line 1-4),

Bradley does not explicitly disclose deriving from one of two omni-directional

microphones the first signal having an omni-directional polar pattern. However Bradley

discloses deriving from the average of two omni-directional microphones the first signal

having an omni-directional polar pattern (Fig. 2 col. 5 line 57-59). It would have been obvious to one of ordinary skill in the art at the time of the invention to try a single omni-directional mic or an average of a number of omni-directional mics in order to provide an omni-directional signal with reduced artifacts or in order to fit size restrictions of an audio device.

Bradley does not explicitly disclose wherein the first signal weight and the second signal weights are calculated in a non-iterative manner by an optimiser, the optimiser taking the first signal and the second signal as inputs, and the optimiser determining from the first and second signals the first and second signal weights by mathematically calculating the first and second signal weights in a manner to comply with predetermined constraints that: (i) the weighted sum is to give the combined adaptive directional signal a constant gain in a predetermined direction, by imposing a constraint that the first signal weight and the second signal weight add to a predetermined value and (ii) power of the combined adaptive directional signal is substantially minimized by ensuring that the derivative with respect to signal weight of the energy of the output signal is zero.

Feng discloses a computer program stored in a computer-readable storage medium, said computer program, when executed by a computer, performing the steps wherein the first signal weight and the second signal weights are calculated in a non-iterative manner by an optimiser, the optimiser taking the first signal and the second signal as inputs, and the optimiser determining from the first and second signals the first and second signal weights by mathematically calculating the first and second signal weights

in a manner to comply with predetermined constraints (Fig. 7 abstract col. 6 line 15-65)

that: (i) the weighted sum is to give the combined adaptive directional signal a constant

gain in a predetermined direction, by imposing a constraint that the first signal weight

and the second signal weight add to a predetermined value and (ii) power of the

combined adaptive directional signal is substantially minimized by

ensuring that the derivative with respect to signal weight of the energy of the output

signal is zero (Fig. 7 abstract col. 6 line 15-65).

Furthermore Feng discloses the first and second signal can be derived from

microphones of various directivity including omni-directional and bi-directional (col. 18

line 30-37).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the

invention to modify the microphone configuration of Bradley with the adaptive summing

process of Feng in order to better suppress interference in input audio signals.

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2.   Claims 11, 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Bradley (5463694) in view of Feng et al (7076072) in view of Masuda et al (5384843).

Claim 11 analyzed with respect to claim 1, Bradley in view of Feng does not explicitly

disclose whereby said signal weights are calculated so as to construct an omni-

directional combined signal when a total power in said first signal is below a certain

value.

Masuda discloses whereby said signal weights are calculated so as to construct an omni-directional combined signal when a total power in said first signal is below a certain value (Fig. 10 and col. 9 line 21-46).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the mic array of Bradley & Feng with the switch processing of Masuda in order to improve audio quality of the received signal.

Claim 27 analyzed with respect to claim 20 recite the limitations of claim 11.

3.   Claims 16,31 are rejected under 35 U.S.C. 103(a) as being unpatentable over over Bradley (5463694) in view of Feng et al (7076072) in further view of Warren (7471798).

Claim 16 analyzed with respect to claim 13-14, 1 Bradley in view of Feng do not explicitly disclose further comprising amplifying the signals produced by the front and/or the rear microphone before constructing the bi-directional signal, to ensure an equivalent gain between the microphones.

Warren discloses amplifying the signals produced by the front and/or the rear microphone before constructing the directional signal, to ensure an equivalent gain between the microphones (Fig. 14 and col. 11 lines 35-45).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the

invention to modify the mic inputs of Bradley in view of Feng with the matching of

Warren in order to improve the accuracy of the beamforming process.

Claim 31 analyzed with respect to claim 20, 28 recite the limitations of claim 16.

4.   Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bradley

(5463694) in view of Feng et al (7076072) in view of Hoshuyama (5627799).

Claim 26 analyzed with respect to claim 20, Bradley in view of Feng does not disclose

including a leaky integrator to perform a running sum on said first and second signal

samples in order to address issues of numerical overflow system memory.

Hoshuyama discloses in the prior art a leaky integrator to perform a running sum on

said samples in order to address issues of numerical overflow system memory (Fig. 3

and col. 5 lines 1-8).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the

invention to implement the beam former of Feng with the filter circuitry of Hoshuyama

admitted prior art in order to have a well known and therefore easy to implement

method of filtering the signal.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to FATIMAT O. OLANIRAN whose telephone number is (571)270-3437. The examiner can normally be reached on M-F 10:00-6 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vivian Chin can be reached on 571-272-7848. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

FO

/VIVIAN CHIN/
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